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INCREASING YOUR LUMBER RECOVERY



SAWMILL IMPROVEMENT PROGRAM

U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE



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AGRICULTURAL



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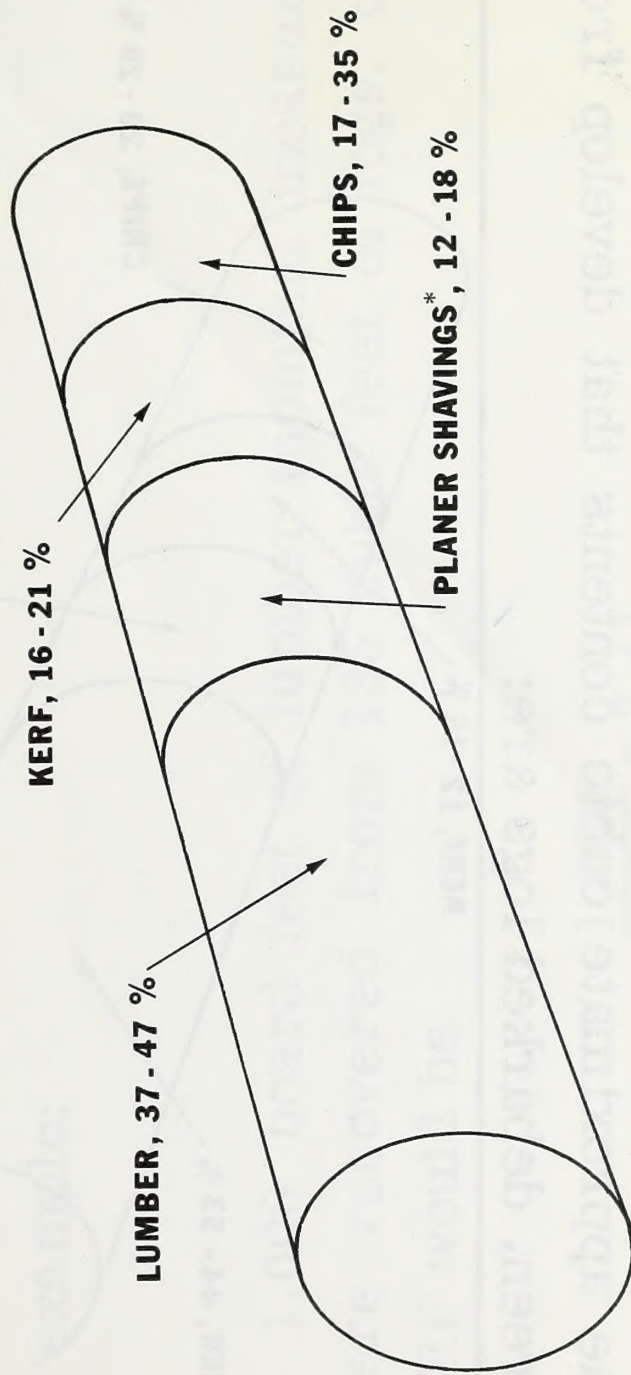
The Sawmill Improvement Program
Forest Service, USDA
Washington, D.C. 20250

24274

#-1185042

For Circular Sawmills

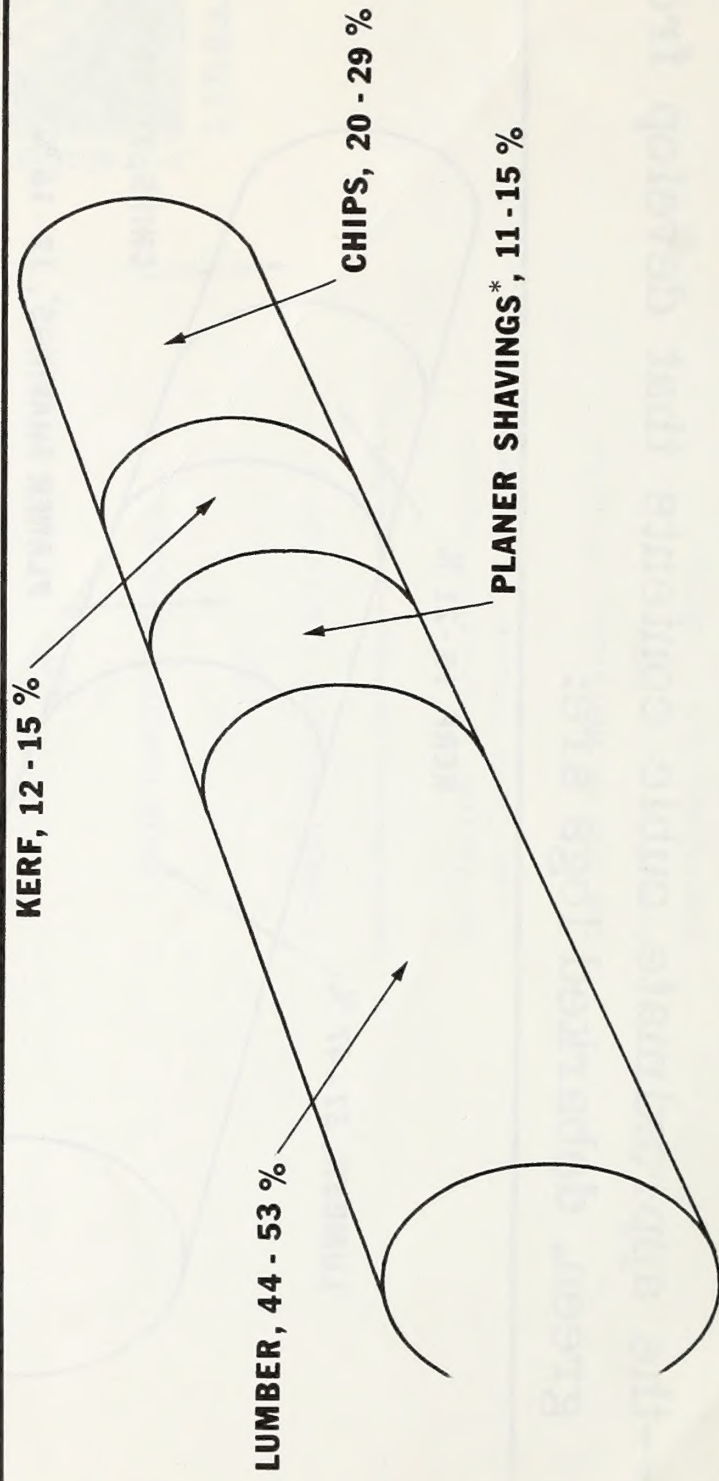
--the approximate cubic contents that develop from green, debarked logs are:



*Includes oversizing, sawing variation, and planing allowance.

For Bandmills

--the approximate cubic contents that develop from
green, debarked logs are:



*Includes oversizing, sawing variation, and planing allowance.

Lumber Recovery Factor (LRF) is the ratio of nominal board feet of lumber recovered per cubic foot of log input to a sawmill.

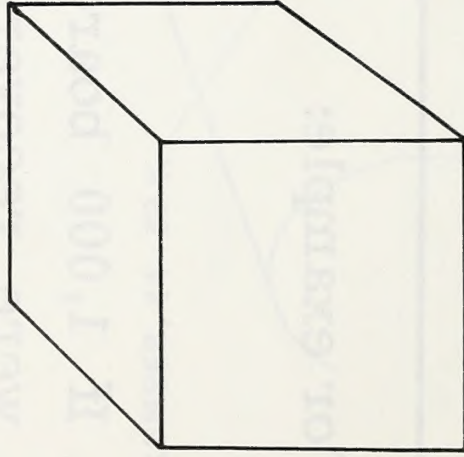
For example:

If 1,000 board feet of lumber (nominal measure) were recovered from 135 cubic feet of logs, the LRF would be

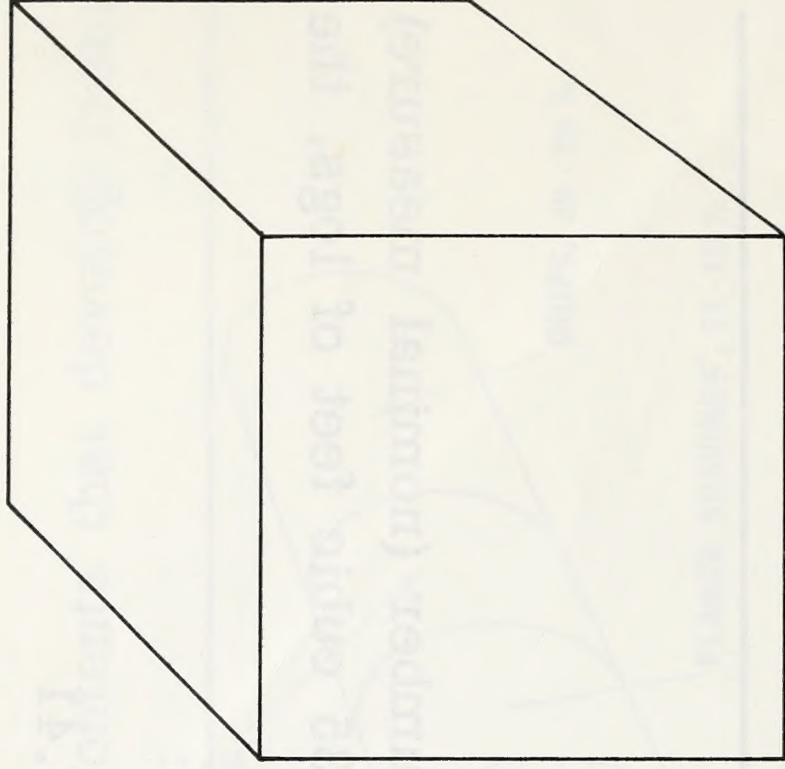
$$\frac{1,000}{135} = 7.41$$

The average LRF for all sawmills in the U.S. is estimated to be 6.5

This means that:



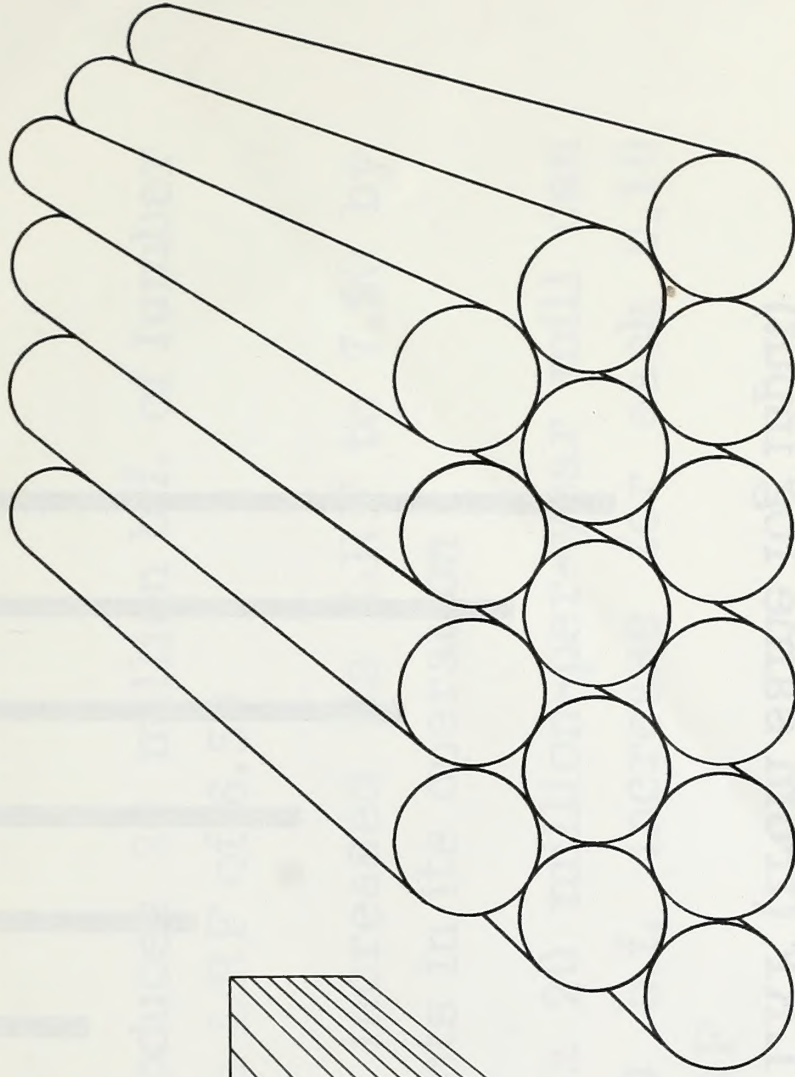
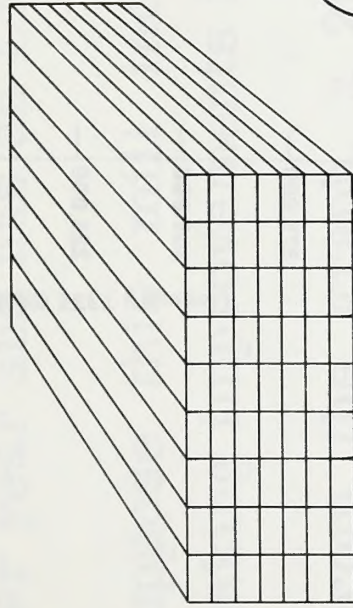
6.5 b.f.



1 cu. ft.

Only 6.5 b.f. of lumber are recovered, on the average, from every cubic foot of log input to a sawmill.

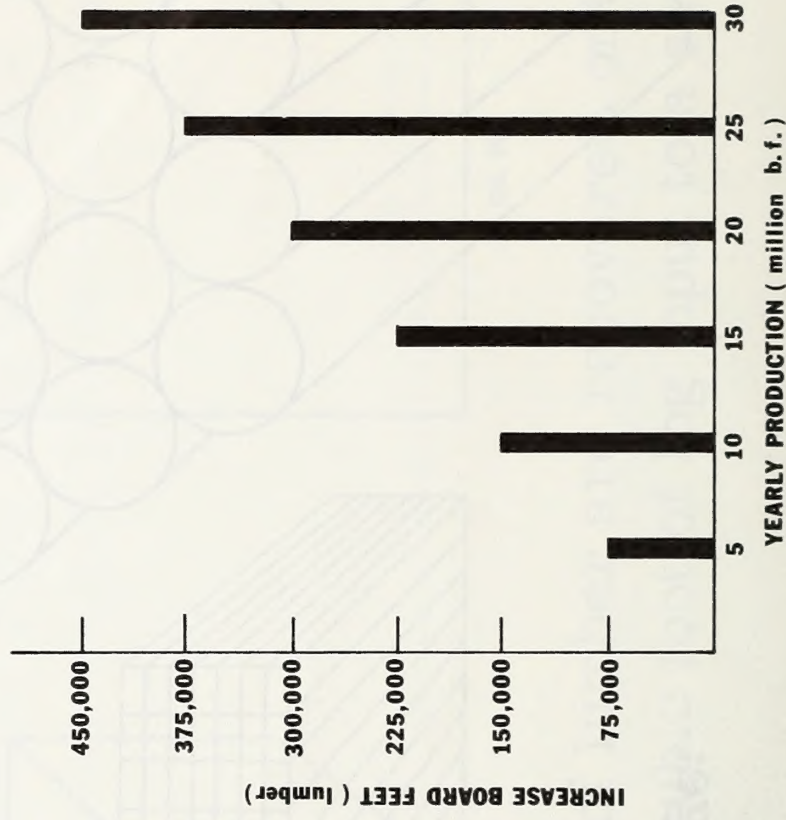
On the average:



650 b.f. of lumber are recovered from each 100 cubic feet of log input to a sawmill.

What effect does increasing LRF have on annual production in a mill with an LRF of 6.5?

Approximate yearly board foot increase for each 0.1 improvement in LRF (from same log input)



For example:

--Assume a mill produces 20 million b.f. of lumber per year and has an LRF of 6.50

--Suppose this mill increased its LRF to 7.20 by making improvements in its operation

--From the graph, a 20 million-per-year mill can realize a 300,000 b.f. increase for each 0.10 improvement in LRF

--Since this mill increased its LRF by 0.70, the approximate yearly increase would be 2,100,000 b.f. of lumber from the same log input.

$$(7 \times 300,000 = 2,100,000)$$

What factors in a sawmill affect LRF and how can LRF be raised?

Factor 1
Mill type and condition

Factor 2
Processing decisions.

Factor 3
Product sizes

Factor 4
Log characteristics

Factor 1

Mill type and condition

To raise your LRF--

- Use saws that minimize kerf
- Reduce sawing variation by tightening up mill

Factor 2

Processing decisions

To raise your LRF--

- Avoid heavy slabbing
- Avoid excessive edging and trimming
- Avoid excessive removal of wood during debarking
- Use computer control for log breakdown decisions

Factor 3

Product sizes

To raise your LRF--

- Salvage smaller lumber
- Eliminate excessive oversizing
- Reduce planing allowance to a minimum

Factor 4

Log characteristics

To raise your LRF--

- Require that logs be bucked to correct length
- Require that logs be bucked to minimize sweep
and crook
- Reduce severely tapered logs to shorter lengths
- Eliminate severely defective logs
- Seek alternative outlets for very small logs

Examples of the increase in LRF obtained by eliminating or reducing unfavorable sawmilling factors:

<u>Factors</u>	<u>LRF</u>
Excessive length in highly tapered logs	0.40
Excessive sweep or crook	0.10
Incorrectly bucked logs	0.10
Defective logs (rot, shake, etc.)	0.15
Excessive saw kerf	
1/16 inch on 4/4 lumber	0.30
1/16 inch on 8/4 lumber	0.18
Excessive planing allowance	
3/32 inch on 4/4 lumber	0.45
3/32 inch on 8/4 lumber	0.27

Excessive sawing variation

1/8 inch on 4/4 lumber

0.60

1/8 inch on 8/4 lumber

0.36

Excessive oversizing

5/32 inch on 4/4 lumber

0.75

5/32 inch on 8/4 lumber

0.45

Excessive removal of wood during debarking

0.20

Excessive slabbing, edging, and trimming

volume

1.00

Nonsalvage of small lumber

0.50

Computer Solutions for Log Breakdown--

Several computer programs exist for determining the best log breakdown pattern.

Scientists at the Forest Products Laboratory have developed one such program entitled Best Opening Face. BOF determines best breakdown patterns for dimension lumber on logs up to about 24 inches in diameter.

Using computer control for log breakdown can raise the LRF by as much as 2.00.

The Sawmill Improvement Program (SIP) was set up to help sawmill operators increase their lumber recovery. To accomplish this, three types of LRF's must first be established:

--Actual LRF

--Predicted LRF

--Calculated maximum LRF

Actual and predicted LRF's are determined both for:

- Current log mix and
- current log mix with overlength eliminated

Calculated maximum LRF is determined for:

- Current log mix with overlength eliminated

Actual LRF is determined by this four-step procedure:

- Measuring lengths of 100 logs and their smallest diameters, inside bark on each end.
- Sawing these logs as a batch in normal manner and carefully tallying output.
- Measuring maximum and minimum dimensions of 20 boards for each thickness and width class of lumber cut
- Analyzing the above information by computer

Predicted LRF is determined by computer simulation
of:

- Reducing sawing variation to attainable levels
- Eliminating excess oversizing
- Reducing planing allowance to attainable levels
- Sawing to minimize slab, edging, and trim volume

Calculated maximum LRF is determined by computer simulation of:

- Reducing sawing variation to attainable levels
- Eliminating excess oversizing
- Reducing planing allowances to attainable levels
- Using computer sawing solutions for log break-down

If desired, the predicted LRF or the Calculated Maximum LRF can be determined for changes in equipment and operations based on:

--Reducing saw kerf

--Salvaging smaller lumber

--Sawing larger average diameter logs

In determining LRF for your sawmill, the following information is obtained:

- Log size distribution
- Volume of logs sawn (cu. ft.)
- Total log overlength (lineal feet)
- Volume of logs sawn, less overlength (cu. ft.)
- Lumber tally from logs sawn
- Sawing variation
- Average within board variation
- Average between-board variation.

What will it cost a sawmill to have a SIP analysis run?

--No charge is made for this service.

--Possibly some reduction in the production rate while study data are collected (normally less than 2 hours)

How can a mill owner implement changes in his mill to raise LRF and thus his lumber recovery?

1. Identify current status of mill conditions
2. Establish objectives for production and quality
3. Devise a plan to move from current status to new objectives
4. Establish a time table in which to carry out plan
5. Translate plan into action
6. Follow up on accomplishments

ACTION STEPS:

1. Identify current status of mill conditions.--You will receive a Conversion Efficiency Report within 3 to 4 weeks after the SIP analysis has been run. This report will contain your current status on LRF, oversizing, planing allowance, sawing variation, and log overlength. The mill study leader will review this report with you at your convenience.
2. Establish objectives for production and quality.--Certain areas in your operation will need more improvement than others. Definite objectives should be established that will bring these areas into acceptable control. An example might be to reduce sawing variation to within a tolerance of plus or minus 3/32 inch. Notify mill personnel what you intend to do!
3. Devise a plan to move from current status to new objectives.--This should be a written step-by-step procedure on how you will achieve your stated objectives. A first step might be to assign the responsibility to one individual and give him authority to do the job. We can supply a list of sawmill engineering consultants who can assist in implementing improvements in your mill.
4. Establish a time table within which to carry out plan.--People directly involved with this effort must have a time limit within which to work or things will be put off until "a more convenient time." Often, a more convenient time never comes.
5. Translate plan into action.--Such an undertaking must always have full backing of top level management to be successful. You must delegate authority along with responsibility. You may show your interest, for example, by requiring a report of achievements as the program moves along. Recognizing these achievements is a good way to remind your people that you are interested in reaching your objectives.
6. Followup on accomplishments.--It is important to know if you have reached your objectives. One way is to conduct a followup study that would confirm any increases in lumber recovery brought about by the Sawmill Improvement Program. If possible, the SIP team will conduct followup studies for this very purpose or you can conduct the study yourself and send the data to the Forest Products Laboratory at Madison, Wis., for analysis and evaluation. The study, of course, must conform to the SIP format.

SIP

E-25 July 1973

